Developing Information Technology Infrastructure and Civil Engineering Education at the National Military Academy of Afghanistan

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Abstract—This paper describes the ongoing development and implementation of a civil engineering program and supporting information technology infrastructure at the newly created National Military Academy of Afghanistan (NMAA) in Kabul. We present a general model for educational capacity-building and apply it to both the information technology infrastructure and civil engineering program development projects at NMAA. We demonstrate how the use of this model facilitated substantive, well-coordinated progress toward the achievement of project goals. We conclude with lessons learned from our experiences in Afghanistan—lessons that are applicable to educational capacity-building in other areas of the developing world as well.

Keywords—Afghanistan, engineering education, information technology, infrastructure

I. INTRODUCTION

This paper describes the ongoing development and implementation of a civil engineering program and supporting information technology infrastructure at the newly created National Military Academy of Afghanistan (NMAA) in Kabul. The authors are West Point faculty members who worked at the NMAA in 2005 and 2007 and have continued their involvement with its development since their return to the U.S. We present a general model for educational capacity-building and its application to both the IT infrastructure and CE program development projects with which we were involved. This model—an enhancement of [1]—facilitated substantive progress toward the achievement of project goals for both projects.

We conclude with a discussion of lessons learned. And while the situation in Afghanistan is unique in many ways, our observations are nonetheless applicable to engineering capacity-building projects elsewhere in the developing world.

II. BACKGROUND

Early in 2003, Afghanistan’s Ministry of Defense and the U.S. Army’s Office of Military Cooperation – Afghanistan (OMC-A) agreed to jointly establish a military academy that would provide the newly created Afghan National Army with a capable, well-educated officer corps [2]. After considering a variety of different institutional formats, the Ministry of Defense ultimately decided that the new academy would be a four-year degree-producing institution modeled on the U.S. Military Academy (USMA) at West Point [3]. Based on this decision, OMC-A enlisted the assistance of USMA in creating the new academy.

Soon afterward, OMC-A established a small U.S. liaison team, the Military Academy Implementation Team (MAIT), based in Kabul. Starting in October 2003, a succession of volunteer USMA faculty and staff members deployed to Afghanistan to augment the MAIT with appropriate expertise in institutional governance, strategic planning, admissions, infrastructure development, faculty development, military training, physical development, and various academic disciplines [4]. These advisors were instrumental in helping the Afghans formulate a blueprint for their new academy—a mission statement, an honor code, an organizational design, a concept plan for its academic, physical, and military development programs, and the essential physical plant to support all these. The new institution was named the National Military Academy of Afghanistan (NMAA) to emphasize its intended purpose as an instrument for enhancing national unity.

A complicating factor in this endeavor has been Afghanistan’s tremendous ethnic diversity and political division among Pashtun, Tajik, Hazara, Uzbek, Aimak, Turkmen, and Baloch sub-populations [5], including a long history of frequent conflict [6]. Most of Afghanistan’s current political leaders recognize that, if their current democratic government is to succeed, these centuries-old ethnic animosities must be overcome. The new Afghan National Army is seen as an important tool for forging a true national identity and for subordinating ethnic and tribal loyalties to the democratically elected national government. As such, the Afghan National Army has been recruited from all of Afghanistan’s ethnic groups, and its composition is roughly representative of the population as a whole. The NMAA has been similarly constituted, with cadets admitted and faculty hired in proportion to their respective ethnic groups’ representation in the Afghan population [7].

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The four-year NMAA curriculum, as jointly developed by the Afghan academy leadership and their U.S. mentors, consists of a 30-course common core augmented by 15 courses constituting an academic major. The core curriculum, which includes 18 courses in the humanities and social sciences, eight in mathematics and basic sciences, two in information technology, and two in engineering, is aimed at producing broadly educated professional officers for the Afghan National Army. Foreign language tracks are available in four languages—English, French, German, and Turkish—with over half of a typical cadet class choosing to study English. The initial plan for the NMAA curriculum called for four majors—civil engineering, information technology, law and political science, and English. Additional majors in general engineering and in language and culture have since been added. Each major provides for the development of intellectual depth in a subject area deemed important to the future of Afghanistan.

With its organization and curriculum established, the NMAA formally opened its doors on March 22, 2005 with 120 of the 353 initial applicants admitted in the first class. A sufficient number of instructors—all of whom are Afghan Army officers—had been assigned to teach the freshman curriculum, and future hires were planned in accordance with the four-year curriculum design. Since then, the number of cadets admitted to each new class has been gradually increased, and faculty strength has expanded accordingly. Admissions for 2010 are expected to top 600, and the academy’s long-term goal is a student body of 4,000.

In the five years since the NMAA opened its doors, the USMA has continued to send teams of faculty volunteers for periods ranging from two months to one year, to further the development of the NMAA’s infrastructure and its academic, military, and physical development programs. In January 2005, E. Ressler deployed to Afghanistan to initiate the development of the academy’s information technology (IT) infrastructure. From January to April 2007, S. Ressler developed the two-course core engineering sequence and the civil engineering (CE) major. Stanton followed immediately afterward to further the implementation of the IT infrastructure. While this paper focuses strictly on our experiences in developing the IT and CE programs, we emphasize that other members of the MAIT and the USMA faculty were engaged in parallel efforts across a wide variety of curricular areas and support functions, as well as institutional governance. Our contributions constitute two small chapters of a much larger story.

III. A MODEL FOR EDUCATIONAL CAPACITY-BUILDING

Based on our collective experiences in Afghanistan, we propose a model for educational capacity-building, as shown in Figure 1. According to this model, major programs at a fledgling educational institution like NMAA should be planned and implemented through carefully synchronized development along the following five parallel axes:

- **Physical plant** – construction of buildings, classrooms, labs, and offices (or adaptation of existing facilities to the needs of the program); and procurement, installation, and maintenance of hardware, software, and communications infrastructure.
- **Curriculum** – design, implementation, assessment, and continuous improvement of an integrated series of courses and co-curricular learning experiences that will facilitate the achievement of program goals.
- **Faculty** – hiring, training, and long-term professional development of the instructors who will own the curriculum and offer it to students.
- **Technical support personnel** – hiring, training, and professional development of lab technicians and support personnel who will sustain and improve IT hardware, software, and communications network components.
- **Governance** – hiring, training, and professional development of leaders who will be responsible for program administration; and establishment of policies that will facilitate effective program administration.

According to this model, overall development toward the desired end state is organized into a series of stages, each of which has one or more intermediate goals. Within a given stage, each axis is composed of a sequence of tasks, and the completion of each task is defined as a milestone. Progress along a given axis is guided and controlled by tracking these milestones using well-defined metrics. Completion of each milestone represents measurable progress toward achievement of the associated goal.

Many of these milestones are interrelated across developmental axes as a result of time dependencies, represented by the vertical arrows in Figure 1. For example, the integration of new lab experiences into a curriculum must be preceded by the acquisition of lab equipment, training of lab technicians, preparation of faculty to teach the new labs, and establishment of procedures for routine maintenance and replenishment of expendable supplies. These dependencies dictate that progress along all five axes must be carefully synchronized. Synchronization is achieved by tracking the achievement of milestones within each axis. If progress along one axis lags, such that a time dependency cannot be satisfied, then an adjustment must be made. Relatively small discrepancies can be addressed by shifting priorities or
reallocating resources. Large discrepancies may require significant adjustments to the entire plan.

In the following sections, we discuss the application of this model to the development of both the IT infrastructure and the CE program at the NMAA.

IV. DEVELOPMENT OF THE IT INFRASTRUCTURE

After spending several months becoming familiar with the NMAA environment and its faculty, staff, and cadets, we defined four stages for the institution’s long-term IT development plan—the starting stage, the developing stage, the mature stage, and the future stage:

- The focus of the starting stage was to provide immediate support to the academic mission by making computers reasonably available to students and faculty. Early learning objectives were modest: gain skills in software applications useful for planning and management. To these, the NMAA senior faculty quickly added Internet use in order to compensate the general lack of library and textbook resources of all kinds, these having been destroyed during the recent years of Taliban rule.

- The developing stage objective was to enhance classroom presentation techniques with mobile computer and projector kits. Limited resources would be maximized by moving them to the place they were most-needed.

- The mature stage included a considerable expansion through the development of an intranet for increasing the capabilities for classroom interaction, lesson preparation, and student out-of-class assignments. The intranet would have the added benefits of simplifying communication and administration, including ubiquitous Internet access via a combined wired and wireless network.

- Finally, the goal for the future stage was to provide a robust environment, including additional messaging and administrative services, enhancement to Internet connectivity, and a portable computer for each cadet.

Thus far, we have completed the starting and developing stages, which have produced useful electrical power, computer and telephone networks, and a minimal level of technology support personnel training and policies; the mature stage is in progress. For illustrative purposes, we now focus on progress toward achieving one particular intermediate goal of the mature stage—implementing intranet directory services—the database of user administrative and authentication information that lies at the heart of any modern enterprise. The tasks associated with this goal and the associated time dependencies are incorporated into the program development model in Figure 2. Arrows in the diagram reflect logical dependencies, for example: a room was needed before a server could be installed, a server was needed before training could be completed, training was needed before a server could be configured with a directory and security domain, and organizational policies were needed before policy objects (GPOs) could be added to complete the directory and security domain.

Administrative dependencies often dominated the logical ones. During implementation, the NMAA administrator responsible for building space initially refused to provide a server room or air conditioner. The IT staff’s involvement in resolving this issue diverted them from their principal task of learning how to administer a domain. The NMAA administration was slow to recognize the need for policies governing server administration. In each of these cases, the program development model facilitated detection of the problem, understanding of its impact on goal achievement, and development of a strategy to move forward. In all cases, we were able to shift priorities or resources to sustain progress.

By the time of our departure in July 2007, NMAA had a working intranet with all of faculty, cadets and machines entered in the security domain. An appropriate GPO had been applied for administrative purposes. The faculty had attended a seminar on the benefits of the new resources and a few had begun to employ them effectively. The technical staff was administering the system without assistance.

V. CIVIL ENGINEERING PROGRAM DEVELOPMENT

In the context of our model, development of the NMAA Civil Engineering (CE) program was also organized into four stages. In this case, however, the stages corresponded with academic semesters—the 5th through 8th semesters of the 8-semester NMAA curriculum.

- The intermediate goal for Semester 5 (the first semester in which CE instruction would be offered) was to design the full 16-course CE curriculum, to develop the two courses that would be offered during that semester, and to prepare the faculty to teach these courses.

- The goal of the remaining three stages was to develop the courses that would be offered during Semesters 6, 7, and 8, and to prepare the faculty to teach these courses.

The first stage began with our arrival in Kabul in January 2007 and was focused on preparing for the start of Semester 5 classes immediately following the Islamic new year in late March. The tasks associated with this stage are depicted graphically in Figure 3 below.
As with the IT infrastructure project, development of the NMAA CE program was fraught with unanticipated challenges. Our ability to respond effectively to these challenges was greatly enhanced by our understanding of the time dependencies across developmental axes, as depicted in the model.

NMAA faculty hiring was greatly constrained by an Afghan Ministry of Defense policy requiring that all faculty members be Afghan military officers. This policy proved to be unworkable, because there were evidently no officers in the Afghan National Army with even a minimally adequate background to teach college-level engineering. After much deliberation, the Ministry of Defense agreed to allow civilian professors from Kabul University to be hired as adjunct instructors at the NMAA. With the assistance of the Dean of Engineering at Kabul University, we were able to hire our first cohort of four Afghan adjunct instructors relatively quickly after the new policy went into effect. Although one of these four was almost immediately hired away from us by the United Nations, the remaining three hires proved to be quite successful. In the short term, however, the delay in implementing these hires caused a corresponding delay in the initiation of curriculum development work.

With our first faculty cohort on board, we were able to initiate the design of the 16-course CE curriculum. Our newly hired instructors were instrumental in the success of this effort, as they were able to draw upon their own experience in the Afghan construction industry and the expertise of their colleagues at Kabul University. We were also able to consult with engineering practitioners from the U.S. Army Corps of Engineers and the United Nations Office for Project Services, as well as representatives of the Afghan Ministries of Defense and Higher Education. These consultations allowed us to ascertain Afghanistan’s most critical civil infrastructure needs, design standards, commonly available forms of construction technology, and likely roles of future Afghan military engineers. Armed with these insights, we were able to develop a CE curriculum that is relevant to Afghanistan’s needs, accreditable by western standards, and conducive to implementation by a relatively inexperienced faculty [8].

Having defined the overall design of the CE curriculum, we began development of the two introductory engineering courses that would be offered in Semester 5. Because only about half of the cadets in each NMAA class study English, it was necessary to have all of our course materials translated into Dari—the official language of NMAA and one of two principal languages spoken in Afghanistan. The MAIT employs a pool of Afghan translators, and the CE program was assigned one of these translators to support our curriculum development work. We soon discovered, however, that his work was entirely inadequate, because of his lack of familiarity with engineering terminology. This situation dictated a drastic shift in our plans, as we had no choice but to ask our adjunct faculty members to take on the task of translating course materials in addition to their other responsibilities. Ultimately, this change resulted in a substantial improvement in the quality and usability of our course products—but it also imposed further delays on the course development task.

With course development well underway, we paused to offer a two-day teaching effectiveness workshop to the CE faculty members. This workshop focused on the use of learning objectives, instructional design, and pedagogies of engagement. The experience proved invaluable for the Afghans, whose previous academic experience had been in non-interactive classroom environments modeled on the outmoded Soviet educational system.

In parallel with our curriculum development work, we also designed and initiated the procurement of equipment for two new laboratory facilities. One, a computer-aided engineering lab, was to be equipped with 20 state-of-the-art computer workstations and engineering software selected to augment the CE curriculum. The other, a testing laboratory, was configured to include standard materials testing equipment for concrete and soil, small hand-operated uniaxial tension and torsion testing machines, a structural testing frame, a flume, and total station surveying equipment. However, because of the long lead time on ordered equipment, difficulties getting the equipment into Afghanistan, and problems with software licensing, we were unable to get either lab fully operational by the time our deployment ended. Thus we were also unable to train the faculty on the use of these labs.

Our efforts to hire a qualified lab technician were also unsuccessful. However, after three months of effort, we were able to hire a CE Department Head—an Afghan National Army officer whose technical qualifications were marginal but who has proved to be an able administrator in the succeeding years.

By the time that Semester 5 classes began on 24 March 2007, we had successfully completed all planned tasks on only one of the five axes—curriculum. Given our failure to hire a lab technician or to complete the equipping of our two laboratories, the lab exercises in our two Semester 5 courses had to be greatly abbreviated. The remaining unfinished tasks—completion of lab equipment installation, training on the use of this equipment, training of the new Department Head, and development of policies for program...
administration—were passed along to the next team of USMA mentors, who deployed to the NMAA two months later.

Since our return from Afghanistan, four USMA CE mentor teams have succeeded us at the NMAA. Thanks to a comprehensive program development plan and careful coordination between deployments, successive teams have been able to facilitate continued progress along all five developmental axes with only minimal loss of continuity. As of this writing, 15 of the 16 planned CE courses have been developed and implemented. Both lab facilities are equipped and functional, and a laboratory technician is on staff. The CE Department is recognized as one of the best administered organizations at NMAA. Expansion of the faculty to accommodate the added courses and increased numbers of students has gone relatively smoothly. However, the Department Head remains the only full-time faculty member in the department. All other instructors are Kabul University adjuncts, and so the faculty experiences continual turnover and constant demand for training of new hires. Overreliance on adjunct faculty—and the consequent lack of continuity and commitment—remains the greatest challenge to the long-term success of engineering education at the NMAA. Because of the high demand for engineers throughout Afghanistan, this challenge is not likely to be satisfactorily met in the near term.

Other remaining CE program development tasks include the refinement and integration of courses and labs, further faculty development, and implementation of an academic assessment system. An interim assessment of program effectiveness is reported in [9]. A comprehensive, outcomes-based assessment of the program is planned for later in 2010.

VI. CONCLUSIONS

Educational capacity-building in a developing nation requires careful planning to overcome environmental and cultural constraints, while establishing conditions for long-term sustainability and growth of newly created institutions. Our proposed model provides a tool to enhance the planning and implementation of such projects by emphasizing staged development along five parallel axes, intermediate goals, and synchronization through the use of time-dependent milestones.

In developing both the IT infrastructure and the CE program at NMAA, we also learned a number of general lessons that can reasonably be applied to similar engineering capacity-building projects elsewhere in the developing world. These lessons are as follows:

A. Physical presence matters.

Facilitating development in a place like Afghanistan involves, first and foremost, building personal relationships and earning trust. Such relationships cannot be established and nurtured from afar. While in Afghanistan, we encountered several aid programs that were foundering because well-meaning donors chose to administer their projects from outside the country. Some of these programs attempted to provide support that was unwanted or ill-suited to the needs of the aid recipients. For example, one university-based project sought to provide distance education courses to students at Kabul University, even though the university’s internet connectivity was entirely inadequate. Other programs provided funding that was misspent for lack of direct oversight. For example, a major externally funded renovation of Kabul University’s engineering building produced a retrofitted heating system that failed within weeks of project completion. Other donors provided the university with sophisticated laboratory equipment, even though the Afghans had neither the expertise nor the resources to operate it. Without on-the-ground mentorship, a thorough plan that accounts for task synchronization using a model such as the one we propose, and active oversight, developmental aid is too often wasted.

B. Cultural awareness enhances conditions for success.

In preparation for our deployment, we read extensively about Afghanistan’s history and culture, and we learned a few simple phrases in Dari. In our interactions with Afghan colleagues, we made a concerted effort to demonstrate interest in their culture and customs. This interest paid large dividends in strengthening our working relationships with our hosts, rendering our work more enjoyable as well as productive.

C. The host institution must own the development process.

Having suffered through three decades of near-constant war and repressive governments, Afghanistan’s higher education system and academic culture are as badly broken as its physical and information infrastructure. The Afghans we met were hungry for guidance on how to rebuild. Under the circumstances, there was a natural tendency for us to step in and take charge—to dictate the direction and pace of change, and to impose our own ideas upon our hosts. Indeed, the Afghans were often content to have us take charge. Continuing in this manner would be counterproductive, however, as the Afghans must ultimately take control of their own destiny. Thus we had to be constantly conscious of our role as mentors, not supervisors. We made every effort to engage our Afghan colleagues as active participants in all aspects of program development, and we always deferred to them for final programmatic decisions. Indeed this was essential: the flexible leadership that the NMAA sought to develop in its students was rooted in empowering people at the points where decisions were needed. It was vital for us to practice what we expected our colleagues to ultimately teach. Widespread buy-in to this principle among administration, faculty, and staff had the desired effect. Newly empowered people throughout the NMAA promoted synchronization and took initiative to prevent stalls in our plan’s execution.

D. Be patient.

Capacity-building in the developing world is likely to involve some measure of cultural change. For example, goal-setting, planning, and assessment were foreign ideas to many of the Afghans we met. Helping our colleagues understand and internalize the value of these activities was (and continues to be) a gradual process. Cultural change must necessarily be evolutionary, even generational. Thus, throughout our involvement with NMAA, we have learned to seek progress in small increments, to be flexible, to accept occasional setbacks, and to adopt a long-term perspective on the prospects for success. In such an environment, continuous assessment
according to our model provides a consistent method of communicating current status and progress.

E. Create a mechanism for long-term continuity of effort.

Our work at the NMAA was one small portion of a large, complex enterprise that has involved over fifty faculty members, contributing during a series of intense two-month to twelve-month periods distributed discontinuously over eight years. In reviewing the work of our predecessors, we found frequent instances of "reinventing the wheel" and of positive changes that failed to take hold because they were not passed along to successors. A well-documented plan and a formalized process of knowledge management across interventions are essential for continuous progress. A small staff team charged with long-term oversight of all efforts is a boon to efficiency.

F. Balance employing engineers with growing engineers.

An essential component of capacity-building is developing human capital—imparting critically needed professional skills to people who will then contribute to the long-term development of the nation. In this context, it makes perfect sense for a capacity-building project to employ local engineers and technicians in both industry and education, to the greatest extent possible. Doing so provides professional development for the individuals and an incentive for future generations to enter the profession. The problem we observed in Afghanistan is that the demand for qualified engineers and technicians far exceeds the supply. Non-governmental organizations and, to a lesser extent, the U.S. Government are able to offer very lucrative salaries to Afghan engineers and technicians; thus, these organizations are able to hire the best and brightest—much to the detriment of Afghanistan’s own universities. At Kabul University, faculty members are so heavily engaged in consulting for western aid agencies that they can devote only minimal attention to their teaching responsibilities. Students, the nation’s future engineers and technicians, suffer the consequences. A government entity like the NMAA is constrained to pay its permanent faculty according to standardized Ministry of Defense pay scales and cannot possibly compete with well-resourced western aid agencies. As a result, the development of a well qualified permanent faculty remains the single greatest threat to the long-term success of this institution. In effect, the nation’s current demand for engineers and technicians is compromising its capacity to grow new engineers and technicians for the future. In our view, it falls to the employers to recognize this problem and seek a better balance.

REFERENCES


Developing Information Technology Infrastructure and Civil Engineering Education at the National Military Academy of Afghanistan

COL Stephen Ressler
COL Gene Ressler
MAJ Paul Stanton
U.S. Military Academy at West Point

The National Military Academy of Afghanistan (NMAA)

- Founded in 2003 by the Afghan Ministry of Defense and the U.S. Army
- Educate and train professional officers for the Afghan National Army
- 4-year degree-producing institution modeled on West Point
- Students and faculty drawn from all of Afghanistan’s ethnic groups
- A tool for forging a new national identity
Afghanistan in 2003

- Physical infrastructure largely destroyed
- Educational system functioning—but just barely
- Severe shortages of professionals in all sectors
- Resilient people with a strong desire to make things better

"An entire generation of engineers is missing."
- Dean of Engineering, Kabul U.

The Military Academy Implementation Team (MAIT)

- 5-10 U.S. advisors
- Augmented by West Point staff and faculty:
  - Institutional governance and planning
  - Admissions
  - Military training
  - Physical development
  - Academic disciplines
NMAA Development (2003 to 2005)

- Development of mission, goals, organizational structure
- Design of core curriculum
- Selection of faculty and staff for first two academic years
- Initial physical plant development
- Initial IT infrastructure development
- Development of admissions process

NMAA Development (2005 to Present)

- Implementation of admissions process:
  - 120 of 353 applicants admitted in 2005
  - 270 of 1007 applicants admitted in 2006
  - 400 of 3035 applicants admitted in 2010
  - Long-term goal of 600 grads per year
- Implementation of core curriculum
- Development of academic majors (January 2007)
- “Just in time” faculty selection and course development
- Further physical plant development
- Further IT infrastructure development
## The Curriculum

<table>
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<th>Semester</th>
<th>1st Year</th>
<th>2nd Year</th>
<th>3rd Year</th>
<th>4th Year</th>
<th>5th Year</th>
<th>6th Year</th>
<th>7th Year</th>
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<td>Composition (Dari)</td>
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<td>Physical Plant</td>
<td>Faculty</td>
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<td>Law</td>
<td>Information Systems</td>
<td>Physics I</td>
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<td>7th Semester</td>
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<td>8th Semester</td>
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### MAJORS
- Civil Engineering
- Information Technology
- General Engineering
- Law & Political Science
- English
- Language & Culture

### A Model for Educational Capacity-Building

**Start**
- Physical Plant
- Faculty
- Tech. Support Personnel
- Curriculum
- Governance

**Intermediate Goal**
- Desired End State

**LEGEND**
- = Milestone
- = Time Dependency
Development of the IT Infrastructure

- **Starting Stage**
  - Make computers available to faculty and students
  - Faculty internet access for course development

- **Developing Stage**
  - Enhance instruction with mobile computer projection systems

- **Mature Stage**
  - Develop an intranet
  - Provide ubiquitous internet access

- **Future Stage**
  - Additional messaging and administrative services
  - Enhancement to Internet connectivity
  - Portable computer for each student

Application of the Model

- **Physical Plant**
  - Procure server

- **Faculty**
  - Understand Active Directory
  - Establish accounts
  - Incorporate Active Directory

- **Technical Support Personnel**
  - Learn about Active Directory
  - Build domain
  - Implement GPOs

- **Curriculum**
  - Not applicable

- **Governance**
  - Security for room
  - Policies for server admin
  - Policies for GPOs

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**Intermediate Goal**

**Mature Stage**
Development of the Civil Engineering Program

First Stage - preparation for Semester 5
- Design the 16-course CE curriculum
- Develop two CE courses offered during Semester 5
- Develop laboratories
- Hire faculty
- Prepare faculty to teach Semester 5 courses

Remaining Stages – Preparation for Semesters 6, 7, 8
- Develop associated courses and labs
- Hire and train faculty

Application of the Model

Physical Plant
- Procure lab equipment
- Prep lab facilities
- Install equipment

Faculty
- Hire faculty
- Train on pedagogy
- Train on lab equipment

Tech. Support Personnel
- Assign translator
- Hire lab technician
- Train on lab equipment

Curriculum
- Design curriculum
- Develop courses
- Translate course materials

Governance
- Hire Dept. Head
- Train Dept. Head
- Policies for program administration

Intermediate Goal

Preparation for Semester 5
Challenges

- Faculty hiring
- Faculty retention
- Curriculum relevance
- Language and translation
- Faculty training in pedagogy
- Procurement of lab equipment
- Hiring of lab technician and department head

Lessons Learned

- Physical presence matters
- Cultural awareness matters
- Hosts must own the development process
- Be patient
- Create mechanisms for long-term continuity of effort
- Seek a balance between employing engineers and growing engineers
Questions?